

TELEVISION BROADCAST RECEIVING APPARATUS  
AND METHOD THEREOF

BACKGROUND OF THE INVENTION

5 Field of the Invention

The present invention relates generally to a television broadcast receiving technology, and more particularly to a television broadcast receiving technology of receiving encoded video signals, audio  
10 signals, program information signals, etc. as on CS digital broadcasting, BS digital broadcasting and ground wave digital broadcasting, making the video/audio signals displayable by decoding these encoded signals, and providing an electronic program  
15 table (which will hereinafter be abbreviated to EPG) to an operator.

Related Background Art

In the digital broadcasting that has started in recent years, program line-up information is  
20 multiplexed with voice information, etc. and thus broadcast so that a receiver side can create the EPG for facilitating a program selection. FIGS. 10A and 10B show names and functions of program line-up information tables written in a draft of [Program  
25 Line-up Information Utilized for Digital Broadcasting] issued by ARIB (Association of Radio Industries and Businesses). Further, FIG. 11 shows

PIDs (Packet Identifiers) of the program line-up information tables. A name of an organized channel, a name of program, a broadcasting date/time and explanation of content can be obtained by referring to this program line-up information table. Each receiver can create the EPG by use of these pieces of information. FIGS. 2A and 2B shows a display example of the EPG. Specifications of this EPG are in principle a commercial product planning matter of a maker of the receiver but are not standardized.

There have been made a variety of proposals about displaying this EPG. For instance, Japanese Patent Application Laid-Open No. 61-227486 discloses a technology of displaying only program tables after the present time just when looking at the present time. Further, Japanese Patent Application Laid-Open No. 9-37167 discloses a method of changing a display line-up of the EPG in accordance with how an aspect ratio of the display apparatus is set. According to these proposals, the EPG is displayed on the display apparatus, however, for instance, Japanese Patent Application Laid-Open No. 11-275462 discloses a system for printing by a printing apparatus as well as displaying on the display apparatus. Moreover, Japanese Patent Application Laid-Open No. 2001-223968 discloses a printing apparatus for storing the EPG data in a table format after filtering the EPG data,

and laying out and printing the EPG data based on a print control program of a printer apparatus.

[Patent Document 1]

Japanese Patent Application Laid-Open No.

5 61-227486

[Patent Document 2]

Japanese Patent Application Laid-Open No.

9-37167

[Patent Document 3]

10 Japanese Patent Application Laid-Open No.

11-275462

[Patent Document 4]

Japanese Patent Application Laid-Open No.

2001-223968

15 The examples of the prior arts described above are based on the premise that the EPG is displayed on a normal consumer television image receiver (horizontal and vertical resolutions are respectively 720 and 480 or 1920 and 1080) having a comparatively  
20 low resolution, and hence a quantity of information displayable at one time is small. To be more specific, for example, only program information for 5 channels for 3 hours can be displayed at one time, wherein a viewer has no alternative but to view the  
25 desired program information in a way that scrolls a screen by use of a remote controller, etc. Further, the problem is not solved even by printing the EPG on

this screen. Besides, this problem becomes more conspicuous in the digital broadcasting of which multi-channels are characteristic. Moreover, it is easily presumed from the examples of the prior arts  
5 to print all pieces of audio-visually enjoyable EPG information, however, none of the examples of the prior arts of the EPG printing took an easy-to-view contrivance to the operator into consideration.

An object of the present invention is to  
10 provide a television broadcast receiving technology enabling an acquisition of all-hour program information of all the audio-visually enjoyable channels in an easy-to-view form to the viewer separately from the EPG displayed on the display  
15 apparatus.

#### SUMMARY OF THE INVENTION

To accomplish the above object, a television broadcast receiving apparatus according to the  
20 present invention includes a receiving unit for receiving television broadcasting waves transmitted in a way that multiplexes program information data together with plural pieces of program data, and a print controller for converting the program  
25 information data received by the receiving unit into data for printing, and outputting program information to a printer, wherein the print controller determines

a print mode of the program information so that the program information is laid out just on a predetermined number of page(s).

5 BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an explanatory block diagram of an example of a whole architecture in embodiments of the present invention;

FIGS. 2A and 2B are explanatory conceptual  
10 diagrams of an EPG image in an example of the prior art;

FIG. 3 is an explanatory conceptual diagram of a program guide information image in a first embodiment of the present invention;

15 FIG. 4 is an explanatory conceptual diagram of the program guide information image in a second embodiment of the present invention;

FIG. 5 is an explanatory conceptual diagram of the program guide information image in a third  
20 embodiment of the present invention;

FIG. 6 is an explanatory flowchart of a system control unit in the first embodiment of the present invention;

FIG. 7 is an explanatory flowchart of the  
25 system control unit in the second embodiment of the present invention;

FIG. 8 is an explanatory flowchart of the

system control unit in the third embodiment of the present invention;

FIG. 9 is comprised of FIGS. 9A and 9B showing explanatory flowcharts of the system control unit in a fourth embodiment of the present invention;

FIG. 10 is comprised of FIGS. 10A and 10B showing explanatory diagrams of tables related to program line-up information in digital broadcasting; and

FIG. 11 is an explanatory diagram of the tables related to the program line-up information in the digital broadcasting.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

One characteristic of embodiments of the present invention lies in a contrivance of enabling an operator to print all items of program guide information in an easy-to-view form by use of a high-resolution printing unit so as to simply immediately obtain a necessary item of program guide information. In the case of utilizing the high-resolution printing unit, for example, a printing unit having a resolution on the order of 600 dpi, it is possible to acquire the number of (both horizontal and vertical) pixels that is approximately ten times the number of pixels by a normal NTSC (National Television System committee)-based TV image receiver even on a sheet of

A4-sized paper. Accordingly, the great majority of program information can be listed up by a layout, wherein a time axis for 24 hours is taken on a vertical axis (short side) defined as one side of the sheet, and an audio-visually enjoyable program is  
5 taken on a horizontal axis (long side) defined as another side of the sheet.

According to a first embodiment (corresponding to second and third print modes) of the present  
10 invention, predetermined number of channels are printed in a predetermined font size on one sheet of paper, and a necessary number of sheets are printed, thus printing all the audio-visually enjoyable channels. According to the first embodiment of the  
15 present invention, there are two cases, i.e., a case in which the program guide information is printed separately for the morning (A.M.) and the afternoon (P.M.) and a case of being printed simultaneously on one page. Any cases are, as a matter of course,  
20 available, however, a larger font can be, needless to say, used in the A.M/P.M. separate printing mode. Further, a comparatively large font size is fixed for an easy-to-see print to senior persons, and the program guide information can be printed on plural  
25 pages of fixed-size sheets, corresponding to the number of channels.

According to a second embodiment (corresponding

to a fourth print mode) of the present invention,  
roll paper is utilized as the printing paper, whereby  
the layout processing is omitted in a way that  
calculates the number of channels for one sheet in  
5 the first embodiment.

According to a third embodiment (corresponding  
to a first print mode) of the present invention, a  
contrivance is that a preferable font size is  
determined corresponding to the number of audio-  
10 visually enjoyable channels, and all the items of  
program information can be printed on one sheet. In  
this case, all the information, though the font size  
becomes small, can be laid out just on one sheet of  
fixed-size paper, and hence the time for acquiring  
15 the necessary item of information is shortened and  
the sheets are saved.

A fourth embodiment of the present invention  
enables the operator to select the printing methods  
in the first, second and third embodiments.

20 (First Embodiment)

The first embodiment of the present invention  
will hereinafter be discussed with reference to the  
drawings.

In the following explanation, the solid line  
25 represents a data line, and the broken line  
represents a control line.

FIG. 1 is a block diagram showing an example of



architecture of a television image receiver (a program information print control apparatus) in the first embodiment of the present invention.

This block is constructed of a front end units  
5 1.1, a CA (conditional Access) unit 1.2, a demultiplex unit 1.3, a decoder 1.4, a display control unit 1.5, a display unit 1.6, an external input receiver 1.7, a drawing unit 1.8, a memory 1.9, a print controller 1.10, a printer 1.11 and a system  
10 control unit 1.12.

Transport streams demodulated by the front end unit 1.1 are, if scrambled (encrypted), descrambled by the CA unit 1.2 and thereafter demultiplexed into video/audio/information signals by the demultiplex  
15 unit 1.3. Among these categories of signals, the video signal is decoded by the decoder 1.4 and converted by the display control unit 1.5 into a signal displayable on the display unit 1.6. The system control unit 1.12, upon detecting a program  
20 guide print request give from an operator via the external input receiver 1.7, creates a program guide image (an EPG image for print) by use of the drawing unit 1.8 on the basis of the program information data obtained from the demultiplex unit 1.3 described  
25 above, and has the created image stored on the memory 1.9. The thus stored program guide image is sent to the print controller 1.10 at a desired timing, then

converted into signals suited to the printer and printed by the printer 1.11. Note that audio signal is not related to the embodiments of the present invention, and hence its explanation is omitted.

5           <Front End Unit>

The front-end unit 1.1 is, in detail, constructed of a tuner unit, a demodulation unit and an error correction unit (unillustrated). The front-end unit 1.1 demodulates RF signals outputted from an antenna (not shown), and, after being, for example, 8PSK-demodulated, an error is detected and corrected as the necessity may arise.

          <CA Unit>

The CA unit is, in detail, constructed of a CAM (Conditional Access Module) of an IC card, a card reader and a descrambler (not shown). The CAM is stored with a key together with a decryption program that is needed for decrypting a cryptogram and with accounting information, etc.. In case signals encrypted (scrambled) on the side of a broadcasting station are sent, an encrypted work key is scrambled in broadcasting waves is decrypted by use of this intra-CAM master key, then the cryptogram of the scramble key is decrypted by using this work key, and descrambling of a TS (Transport Stream) payload is performed by use of this scramble key. Note that a judgement as to whether the encryption is done or not

is made in a way that refers to a scramble control flag and adaptation field control stored in a TS packet header.

<Demultiplex Unit>

5       The demultiplex unit 1.3 demultiplexes the transport streams outputted from the CA unit 1.2 respectively into video/audio/information signals. Among these categories of signals, the video signal is outputted to the decoder 1.4, the audio signal is  
10      outputted to an audio output unit such as a speaker, etc. through an unillustrated D/A converter, and the information signal is outputted to the memory 1.9 via the system control unit 1.12.

<Decoder>

15       The decoder 1.4 decodes the video signal outputted from the demultiplex unit 1.3 and outputs the decoded signal to the display control unit 1.5.

<Display Control Unit>

Subsequently, the display control unit 1.5 will  
20      be explained. The display control unit 1.5 converts the signals outputted from the decoder 1.4 into data displayable on the display unit 1.6.

<Display Unit>

The display unit 1.6 may be a thin and  
25      lightweight type dot matrix display such as a liquid crystal display and a plasma display and may also be a normal CRT display.

<External Input Receiver>

The external input receiver 1.7 is a unit for receiving an operation of the operator using an operation key provided on a front surface of a remote controller or the TV receiver, and is controlled the system control unit 1.12 that will be described later on. The external input receiver 1.7 is used for the EPG print request, etc. given from the operator. In a case where the operation of the operator is performed by the normal remote controller, the external input receiver 1.7 performs a role as an IR (infrared-rays) receiving unit.

<Drawing Unit>

The drawing unit 1.8 undergoes control of the system control unit 1.12 that will hereinafter be explained, and creates a program guide image containing a description of the program information by use of the program information data (see FIGS. 10A and 10B) outputted from the demultiplex unit 1.3. FIG. 3 shows an example of the program guide image in the first embodiment of the present invention. FIG. 3 illustrates the example in which the program guide is divided into A.M. programs and P.M. programs, and the number of channels printed on one page is set to 8. As a matter of course, both of the A.M. programs and P.M. programs can be printed at one time.

<Memory>

The memory 1.9 is stored with the program guide image created by the drawing unit 1.8. The program guide image stored on the memory 1.9 is read at a preferable timing when printed by the printer 1.11  
5 under the control of the system control unit 1.12.

<Print Controller>

The print controller 1.10 receives the program guide image stored on the memory 1.9 under the control of the system control unit 1.12 that will be  
10 explained later on, and converts this program guide image into signals suited to the printer 1.11 which will hereinafter be described.

<Printer>

The printer 1.11 receives the signals outputted  
15 from the print controller 1.10 and prints the program guide image. A premise in the first embodiment of the present invention is that the program guide image be printed on a fixed-size sheet such as A3-, A4- and B4-sized sheets. Cases of other embodiments will be  
20 described later on.

<System Control Unit>

Finally, the system control unit 1.12 will be explained with reference to a flowchart in FIG. 6. The system control unit 1.12 receives each of program  
25 line-up information tables (see FIGS. 10A and 10B) from the demultiplex unit 1.3 (S6.1), and calculates the number of audio-visually enjoyable channels

(which will hereinafter be abbreviated to CH\_TOTAL)  
(S6.2). Then, the number of pages (which will  
hereinafter be referred to as PAGE) that should be  
printed is calculated by dividing CH\_TOTAL by the  
5 number of channels printable on one page (which will  
hereinafter be abbreviated to CH\_MAX\_1P)  
predetermined in consideration of a font size assumed  
to be easy-to-see to the viewers (S6.3).

As shown in FIG. 3, however, in the case of  
10 printing the program guide divided into the A.M  
programs and the P.M. programs, a value of PAGE is,  
as a matter of course, doubled. In the following  
discussion, a difference between the divided case  
into A.M and P.M. and an undivided case is easily  
15 presumed, and hence this discussion will be focused  
on only the case of printing the program guide  
divided into the A.M programs and the P.M. programs.

Processing of creating the program guide by use  
of the above-described drawing unit 1.8 and storing  
20 the program guide on the memory 1.9 similarly  
described above, will hereinafter be explained.

a) Draw A.M./P.M. tags and a time axis (a left  
end area in FIG. 3) (S6.4).

b) Draw channel numbers and channel names (an  
25 upper end area in FIG. 3) (S6.5).

c) Draw all pieces of A.M. or P.M. program  
information of each channel (S6.6).

d) Repeat back to the processing in b) till the processing is looped (CH\_MAX\_1P)-times (S6.7).

e) Return to the processing in a) till the processing is looped PAGE-times (S6.8).

5 f) Return to the processing in a) till the creations of the program guide images of both of the A.M. programs and the P.M. programs are finished (S6.9).

g) The program guide image stored on the memory  
10 1.9 is transmitted to the print controller 1.10 (S.10).

(Second Embodiment)

Successively, a second embodiment of the present invention will be discussed with reference to  
15 the drawings.

An example of the architecture of the television image receiver in the second embodiment of the present invention is the same as FIG. 1 illustrates in the first embodiment of the present  
20 invention, and therefore its explanation is omitted. Further, the second embodiment of the present invention has a difference only in the processing by the system control unit 1.12 in the architecture in FIG. 1, and hence this difference will be described  
25 referring to a conceptual diagram in FIG. 4 and a flowchart in FIG. 7.

The second embodiment of the present invention

involves using the roll paper as a substitute for the fixed-size sheet utilized in the first embodiment.

FIG. 4 shows an example of the program guide image in second embodiment of the present invention. The

5 second embodiment of the present invention has no necessity of calculating the number of pages to be printed as the first embodiment of the present invention requires. The following is a detailed discussion referring to the flowchart in FIG. 7.

10       The system control unit 1.12 receives each of the program line-up information tables (see FIGS. 10A and 10B) from the demultiplex unit 1.3 described above (S7.1), and calculates the number of audio-visually enjoyable channels (which will hereinafter  
15 be abbreviated to CH\_TOTAL) (S7.2). Herein, the audio-visually enjoyable channels include free-of-charge audio-visually enjoyable channels. As for the fee-charged channels, the program information on only the audio-visually enjoyable channels based on a user  
20 contract may be printed, or the program information on all the fee-charged channels may also be printed. In the case of including the audio-visually enjoyable channels based on the user contract, the number of audio-visually enjoyable channels is calculated with  
25 reference to the user's contract information retained on the TV receiver in addition to the aforementioned program line-up information.



Then, processing of creating the program guide in the predetermined font size assumed to be easy-to-see to the viewers by use of the drawing unit 1.8 described above and storing the created program guide on the memory 1.9 similarly described above, will be explained. As illustrated in FIG. 4, however, in the case of printing the program guide divided into the A.M. programs and the P.M. programs, the value of CH\_10 TOTAL is, as a matter of course, doubled. In the following discussion, the difference between the divided case into A.M and P.M. and the undivided case is easily presumed, and hence this discussion will be focused on only the case of printing the program guide divided into the A.M programs and the P.M. 15 programs.

a) Draw A.M./P.M. tags and a time axis (a left end area in FIG. 4) (S7.3).

b) Draw channel numbers and channel names (an upper end area in FIG. 4) (S7.4).

20 c) Draw all pieces of A.M. or P.M. program information of each channel (S7.5).

d) Repeat back to the processing in b) till the processing is looped (CH\_TOTAL)-times (S7.6).

e) Return to the processing in a) till the 25 creations of the program guide images of both of the A.M. programs and the P.M. programs are finished (S7.7).

f) The program guide image stored on the memory 1.9 is transmitted to the print controller 1.10 (S.7.8).

(Third Embodiment)

5           Successively, a third embodiment of the present invention will be discussed with reference to the drawings.

          An example of the architecture of the television image receiver in the third embodiment of  
10 the present invention is the same as FIG. 1 illustrates in the first embodiment of the present invention, and therefore its explanation is omitted. Further, the third embodiment of the present invention has a difference only in the processing by  
15 the system control unit 1.12 in the architecture in FIG. 1, and hence this difference will be described referring to a conceptual diagram in FIG. 5 and a flowchart in FIG. 8.

          In the third embodiment of the present  
20 invention, the font size is changed corresponding to the number of receivable channels so that the program guide information for 24 hours of all the audio-visually enjoyable channels can be printed on one page. FIG. 5 shows an example of the program guide  
25 image in the third embodiment of the present invention. In the third embodiment of the present invention, all pieces of information are aggregated

on one page, and hence, if the operator is not a senior person, an advantage is that a necessary item of information is easy to detect and at the same time the sheets can be saved. The following is a detailed  
5 description referring to the flowchart in FIG. 8.

The system control unit 1.12 receives each of the program line-up information tables (see FIGS. 10A and 10B) from the demultiplex unit 1.3 described above (S8.1), and calculates the number of audio-  
10 visually enjoyable channels (which will hereinafter be abbreviated to CH\_TOTAL) (S8.2). Then, the number of effectively displayable pixels (CH\_WIDE) per channel and a font size are determined corresponding to the value of this CH\_TOTAL and to size information  
15 of a preset print sheet (S8.3, S8.4). The processing of creating the program guide by use of the drawing unit 1.8 described above and storing the created program guide on the memory 1.9 similarly described above, will hereinafter be explained.

20 a) Draw A.M./P.M. tags and a time axis (a left end area in FIG. 5) (S8.5).

b) Draw channel numbers and channel names (an upper end area in FIG. 5) (S8.6).

c) Draw all pieces of program information of  
25 each channel (S8.7).

d) Repeat back to the processing in b) till the processing is looped (CH\_TOTAL)-times (S8.8).

e) The program guide image stored on the memory 1.9 is transmitted to the print controller 1.10 (S.8.9).

The case of printing the program information of  
5 all the audio-visually enjoyable channels on one page,  
has been discussed so far, however, as other modes,  
the program information may be printed on a set  
number of pages, the program information of  
designated channels may be printed, and the program  
10 information of programs acquired as a result of  
favorite search may also be printed on a  
predetermined number of pages.

(Fourth Embodiment)

Subsequently, a fourth embodiment of the  
15 present invention will be described with reference to  
the drawings.

An example of the architecture of the  
television image receiver in the fourth embodiment of  
the present invention is the same as FIG. 1  
20 illustrates in the first embodiment of the present  
invention, and therefore its explanation is omitted.  
Further, the fourth embodiment of the present  
invention has a difference only in the processing by  
the system control unit 1.12 in the architecture in  
25 FIG. 1, and hence this difference will be described  
referring to flowcharts in FIGS. 9A and 9B.

A contrivance in the fourth embodiment of the

present invention is to enable the operator to select the printing modes in the first embodiment, the second embodiment and the third embodiment of the present invention. This contrivance makes the  
5 program guide information printable by a method that will be felt easy to see to the operator without depending on ages and favorites. Moreover, the embodiments of the present invention have  
10 illustratively dealt with the case of switching over the three printing methods given above, however, as a matter of course, the two methods among them may be selected, or a method(s) may be selected from among a larger number of methods to which other printing methods are added.

15 A detailed explanation will hereinafter be given referring to the flowcharts in FIGS. 9A and 9B. The system control unit 1.12, when accepting a program guide print request via the external input receiver 1.7 described above (S9.1), receives each of  
20 the program line-up information tables (see FIGS. 10A and 10B) from the demultiplex unit 1.3 explained above (S9.2), and calculates the number of audio-visually enjoyable channels (which will hereinafter be abbreviated to CH\_TOTAL) (S9.3). Then, if the  
25 operator has selected the printing method (which will hereinafter be termed a 1-page print mode) according to the third embodiment, processing shown in each of

the following items a) through f) is executed.

a) Calculate the number effectively displayable pixels (CH\_WIDE) per channel in accordance with the value of CH\_Total (S9.5).

5        b) Determine a font size in accordance with the value of CH\_TOTAL (S9.6).

c) Draw A.M./P.M. tags and a time axis (S9.7).

d) Draw channel numbers and channel names (S9.8).

10       e) Draw all pieces of program information of each channel (S9.9).

f) Repeat back to the processing in d) till the processing is looped (CH\_TOTAL)-times (S9.10).

If not so, when the operator has selected the  
15       printing method (which will hereinafter be termed a roll paper print mode) according to the second embodiment, processing shown in each of the following items g) through k) is executed.

g) Draw A.M./P.M. tags and a time axis (S9.12).

20       h) Draw channel numbers and channel names (S9.13).

i) Draw all pieces of program information of each channel (S9.14).

j) Repeat back to the processing in h) till the  
25       processing is looped (CH\_TOTAL)-times (S9.15).

k) Return to the processing in g) till the creations of the program guide images of both of the

A.M. programs and the P.M. programs are finished  
(S9.16).

If not so, when the operator has selected the  
printing method (which will hereinafter be termed a  
5 silver mode) according to the first embodiment,  
processing shown in each of the following items l)  
through r) is executed.

l) The number of pages (PAGE) to be printed is  
calculated in a way that divides CH\_TOTAL by the  
10 number of channels (CH\_MAX\_1P) printable on one page  
(S9.17).

m) Draw A.M./P.M. tags and a time axis (S9.18).

n) Draw channel numbers and channel names  
(S9.19).

15 o) Draw all pieces of program information of  
A.M. or P.M. programs of each channel (S9.20).

p) Repeat back to the processing in n) till the  
processing is looped (CH\_MAX\_1P)-times (S9.21).

q) Return to the processing in m) till the  
20 processing is looped (PAGE)-times. (S9.22).

r) Return to the processing in m) till the  
creations of the program guide images of both of the  
A.M. programs and the P.M. programs are finished  
(S9.23).

25 Then, the program guide images created  
respectively in the 1-page print mode, the roll paper  
print mode and the silver mode and stored on the

memory 1.9, are transmitted to the print controller 1.10 (S9.24).

According to the first through fourth embodiments of the present invention, it is possible to provide the television image receiver capable of simply promptly obtaining the want-to-get information from the program guide information printed in the easy-to-view form.

The present embodiment can be also actualized by a computer executing a program. Further, a means for supplying the computer with the program, for example, a readable-by-computer storage medium such as a CD-ROM, etc. stored with the program, or a transmission medium such as the Internet for transmitting such a program, can be also applied as an embodiment of the present invention. Moreover, a program product of the readable-by-computer storage medium, etc. stored with the above program can also be applied as an embodiment of the present invention. The category of the present invention embraces the aforementioned program, storage medium, transmission medium and program product. The storage medium can involve using, for instance, a flexible disk, a hard disk, an optical disk, a magneto-optic disk, a CD-ROM, a magnetic tape, a nonvolatile memory card, a ROM and so forth.

Note that any embodiments given above are



nothing but the exemplifications in which the present invention is embodied, and the technical range of the present invention shall not be limitedly construed. Namely, the present invention can be embodied in a  
5 variety of forms without departing from the technical concept thereof or from the principal features thereof.

As discussed above, according to the present invention, the program information printed in the  
10 easy-to-view form can be obtained, whereby the want-to-get program information can be simply promptly acquired.